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RESEARCH ARTICLE

First complete description of nest, eggs, and nestlings of the Squamate Antbird, *Myrmoderus squamosus* (Aves: Thamnophilidae)

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ABSTRACT. Even though nest architecture has been useful for phylogenetic inferences among the Thamnophilidae (Aves: Passeriformes), the nests of only three out of five species of *Myrmoderus* (Ridgway, 1909) are known to science. Here we describe the nests, eggs, and nestling of the Squamate Antbird *Myrmoderus squamosus* (Pelzeln, 1868). Two nests were bulky bottom-supported cups, measuring 7.3 and 12 cm in maximum outside diameter, with a noticeably smaller egg cup, and they were placed within the crown of short, broad-leafed plants. Eggs were short-oval, with chalky white background color, and purple blotches and streaks more concentrated in the large end. One nestling was dark reddish grey, with bluish white feet, pinkish gray tarsi, and a blackish bill with bright yellow rictal flanges. In face of the great diversity of nest types found among the Thamnophilidae, we concluded that the nest of *M. squamosus* was similar to those of other congeners, giving support to this currently phylogenetically-defined genus.

KEY WORDS. *Myrmeciza*, nest type, phylogeny, taxonomy.

INTRODUCTION

The typical "antbirds", Thamnophilidae Swainson, 1824, are a diverse group of insectivorous passerines that inhabit the understory and subcanopy of Neotropical forests and woodlands (Ridgely and Tudor 1994, Zimmer and Isler 2003). Within this family, some genera have been long recognized as non- monophyletic and have been reviewed (Isler et al. 2013). Together with morphological, molecular, and ecological data, nest architecture has contributed to the elucidation of phylogenetic divergences, especially at the level of genera. Despite of that, the nests of many species are still undescribed, or have been only roughly described (Greeney et al. 2013, Isler et al. 2013). *Myrmoderus* Ridgway, 1909 was recently resurrected based on a work that combined multiple characters, including nest types (Isler et al. 2013). The nests of three of the five included species have been described in detail: the White-bibbed Antbird *M. loricatus* (Lichtenstein, 1823), the Ferruginous-backed Antbird *M. ferrugineus* (Statius Muller, 1776), and the Scalloped Antbird *M. ruficauda* (Wied, 1831), while nesting information is scarce for the Squamate Antbird *Myrmoderus squamosus* (Pelzeln, 1868) (formerly *Myrmeciza squamosa*), and totally unavailable for the recently described Cordillera Azul Antbird *M. eowilsoni* (Moncrieff et al. 2018). For *M. squamosus*, the description of a single nest is partial: "built near ground level; in it the female lays two eggs, white in color but with a violet tinge at one end and a scattering of tiny red spots" (Höfling et al. 1986). Based on the description and drawing provided by Höfling et al. (1986), Greeney et al. (2013) interpreted the nest of this species as being "an open cup built low to the ground, and (most likely) supported from below," suggesting that a proper description of its architectural details was needed. Although Von Ihering (1900), Nehrkorn (1910), and Schönwetter and Meise (1967) presented egg descriptions for *M. squamosus*, they did not provide any information on nest characteristics.

Here we provide the first detailed description of nests, eggs, and nestling of *M. squamosus*, and we address whether nest characteristics correspond to this currently phylogenetically-defined genus.

MATERIAL AND METHODS

The Squamate Antbird *M. squamosus* is an Atlantic Forest endemic, found in the understory of humid forests and second-growth woodlands from the states of Rio de Janeiro to Rio Grande do Sul, Brazil (Ridgely and Tudor 1994), at altitudes from sea level to 1,000 m (Bencke and Kindel 1999). It is a medium-sized (14–15 cm), sexually dimorphic antbird, with throat coloration varying from totally black in males to white with faint grey barring in females (Zimmer and Isler 2003).

The first nest of *M. squamosus* (hereafter nest 1) was found in lowland forest at Reserva Natural Salto Morato (RNSM), Guaraqueçaba, Paraná state, southern Brazil, near the headquarters of the reserve (25°11' S, 48°17' W, ca. 25 m asl). Recognized as a Natural Heritage Site by UNESCO in 1999, the reserve has an area of 2,340 ha and ranges from 15 m to 918 m asl. Following the Koppen-Geiger climate classification (Kottek et al. 2006), the climate of the region is Cfa - warm temperate and fully humid with hot summer – with a mean annual temperature of 21 °C and monthly means ranging between 25 and 17 °C (Piacentini and Varassin 2007). The second nest (nest 2) was found at Carlos Botelho State Park (PECB), located at São Miguel Arcanjo municipality, São Paulo state, southeastern Brazil (24°04'S, 47°58'W). This park protects a total area of 37,644 ha, includes altitudes from 20 to 1000 m, and has an annual rainfall of 777–2,264 mm (average 1,676 mm, Beisiegel and Mantovani 2006). Average temperatures vary from 18 to 20 °C (Ferraz and Varjabedian 1999). Together with other adjacent reserves, the PECB comprises one of the largest Atlantic Forest remnant that is continuous from southeastern Brazil. The vegetation at the reserve is dominated by submontane rain forest (Oliveira-Filho and Fontes 2000) and the climate is classified as warm temperate and fully humid with hot summer, belong to type Cfa of Koppen-Geiger climate classification (Kottek et al. 2006).

Nest 1 was found opportunistically during field work at RNSM. Nest 2 was part of broader study, in which nests were searched for during periodical visits to PECB, and were located by following adult birds exhibiting territorial defense behaviors (Martin and Geupel 1993). Measurements of nests and eggs were obtained with metal calipers to the nearest 0.1 mm, and eggs were weighed with spring scales to the nearest 0.1 g. Egg shape and nest type classification followed Winkler (2004).

RESULTS

Nest 1 was found on 24 September 2004 in a secondary forest that was contiguous with a large area of primary forest. Nest 2 was located on 22 January 2014 in primary forest. Both nests were bulky bottom-supported cups, noticeably larger than the size of the bird, but with a small and well-formed egg cup (Figs 1, 2). Both nests were embedded within the crown of short, broad-leafed plants (a fern *Blechnum brasiliense* Desv (Fig. 3), and an unidentified bromeliad, respectively). Externally, the nests were slightly oval or ellipsoid, filling the shape of the inner parts of the plants that supported them. The nest walls consisted of a variety of dead vegetative materials, including leaves (many reduced to skeletons), petioles, rachides, long twigs, flexible rootlets, as well as small amounts of green moss (Fig. 2). The egg cups were lined with fine, black fungal rhizomorphs (Fig. 1). Nest 1 measured 7.3 cm in maximum outer diameter and 6.1 cm in inner diameter. Nest 2 measured 12 cm in maximum outer diameter, 6.6 cm in inner diameter, 8.2 cm in height, and 5.2 cm in depth, and they were 30 and 44 cm above ground, respectively. Nest 2 was placed 96 cm from the edge of a small creek, but nest one was not close to water. Generally, the nests could be confounded with the decaying vegetal material that often accumulates in the interior of the supporting plants.

When found, nest 1 contained two eggs (Fig. 1) and nest 2 only one egg (Fig. 2). Eggs were short-oval, with chalky white background color, and purple blotches and streaks more concentrated in the large end (Figs 1, 2). They measured 22 x 16, 23 x 16 (nest 1), and 21.6 x 16.8 mm, and weighed 2.7 g (nest 2). Seven days after its discovery, nest 2 held a single nestling. It was dark reddish grey, with bluish white feet, pinkish gray tarsi, and a blackish bill with inflated, bright yellow rictal flanges (Fig. 4). Male and female of both nests shared incubation (Fig. 3), and in nest 2 we observed the parents also sharing brooding. The fate of the nests is uncertain.

DISCUSSION

Our findings confirmed the bottom-supported open-cup pattern previously predicted for the nest of the Squamate Antbird (Greeney et al. 2013). Further support of our observations on the architecture of the nest of *M. squamosus* comes from a photograph in the WikiAves database (L. Breves, www.wikiaves.com, WA2773587) of a nest with two eggs, built about 20 cm above the ground, amid the newly grown stems of a cut tree. Nests of *M. loricatus*, *M. ferrugineus*, and *M. ruficauda* follow the same general pattern (bottom-supported cup nests) but show some interspecific variation with respect to the materials used at the bottom portion of the nest and its means of support. Nests of *M. ruficauda* and *M. ferrugineus* are quite similar, being placed directly on the leaf litter, or slightly above it, on a platform of dead leaves (Buzzetti and Barnett 2003, Studer et al. 2017). The nest of *M. loricatus* described by Buzzetti and Barnett (2003), however, though also placed directly on the leaf litter, had its base consisting of a noticeable platform of sticks. The nests of *M. squamosus* described here were all situated off the ground and supported only by their substrate plants. Also, based on a visual comparison of our nests with the photographs and data available for *M. ruficauda* and *M. loricatus* (Buzzetti and Barnett

Figures 1–4. Nests, eggs and nestling of Squamate Antbird *Myrmoderus squamosus*: (1) details of the nest and eggs at Reserva Natural Salto Morato, Paraná; (2) details of the nest and egg on a bromeliad at Parque Estadual Carlos Botelho, São Paulo; (3) incubating Female in a nest built on a tree fern; (4) details of a nestling. Photos: DF Perrella and VQ Piacentini.

2003, Studer et al. 2017), *M. squamosus* seems to use a greater amount of fine fibers (e.g. *Marasmius* rhizomorphs) in the inner lining of the nest cup. Despite treating the "*ferruginea* clade" as a single genus (*Myrmoderus*), Isler et al. (2013) discussed the possibility of further dividing it into two or even three genera. Although the existence of three identifiable nest patterns might give support to subdivisions, nest characteristics seem not to corroborate other features. For instance, Moncrieff et al. (2018) suggested that *M. ferrugineus* and the newly described Cordillera Azul Antbird *M. eowilsoni* should be separated in a different subgenus, *Myrmedestes* Todd, 1927, based on behavioral, vocal and morphological synapomorphies, but in the available nest parameters *M. ferrugineus* cannot be distinguished from *M. ruficauda* which, in turn, is closer to *M. loricatus* and *M. squamosus* in plumage (Moncrieff et al. 2018). It is worth noting, however, that the nest of *M. eowilsoni* remains to be described.

Clutch sizes consisted of two eggs in the previous nests reported for the Squamate Antbird (Von Ihering 1900, Nehrkorn 1910, Schönwetter and Meise 1967), and also in all of the nests reported for the other *Myrmoderus*: *M. ferrugineus* (n = 1 nest), *M. ruficauda* (n = 42 nests), and *M. loricata* (n = 1 nest) (Stratford 2000, Buzzetti and Barnett 2003, Studer et al. 2017), matching the general pattern found for tropical forest passerines (Jetz et al. 2008), including other Thamnophilidae found at similar latitudes (Roper 2005, Perrella et al. 2017). The clutch of a single egg found for one of our nests should be viewed with caution, as we were unable to confirm if only one egg was laid or if it could have resulted from a partial nest predation. Eggs also followed the same pattern in all of the *Myrmoderus* species, with whitish background color and purple blotches and streaks. The only other congener for which nestlings are described is *M. ruficauda* (Studer et al. 2017), and they were very similar to Squamate

Antbird in skin, bill, and rictal flange coloration, including the noticeably whitish feet.

Biparental sharing of the duties incubation and nestling attendance is pervasive among the typical antbirds (Skutch 1969, Greenberg and Gradwohl 1983, Zimmer and Isler 2003), although it has been properly quantified only a few times (Perrella et al. 2017). During our observations we confirmed biparental attendance in the Squamate Antbird for both incubation and brooding, a behavior also observed in *M. loricatus* and *M. ruficauda* (Buzzetti and Barnett 2003, Studer et al. 2017). Stratford (2000), however, suggested that incubation in *M. ferrugineus* may be restricted to females, an assertion which needs confirmation.

Nest types among the Thamnophilidae are variable, and involve bottom-supported open cups; rim suspended open cups; domed nests placed on the ground (Greeney et al. 2013), and pendulous rim-suspended nests with a top or lateralized entrance (Isler et al. 2013), and they can indicate phylogenetic divergence, e.g. between tribes and genera (Isler et al. 2013). Here, despite the differences found mainly in nest placement and nest material, nests of all species of *Myrmoderus* known to science followed the same general pattern (open cups-bottom supported), and we conclude that they corroborate other characters that led these species to be included in this genus.

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